

Dept. Genetics,
U. of W.,
Madison, Wis.,
April 27, 1949.

Dear Seymour,

Just received your interesting and imaginative letter. I'm not surprised that the Carnegie Institution of Washington did not know where Kelner was; he has been working in Dr. Demerec's laboratory at Cold Spring Harbor, L.I. If you want to read the scientific details, the work has been published in the Proceedings of the National Academy of Sciences, I think in the Febr. 1949 issue, at any rate, Vol. 35, pp 73-79. You can't take the popular writeups of scientific articles very seriously; instead it would be a good habit to start reading the current issues of the technical journals, like the PNAS, Science, and so on.

I think that you will get a less confused picture of the relationship between radiation and the gene if you study Beadle's review article, Chemical Reviews, Vol 37, pp15-96 (1945). Radiation (X-rays, gamma rays, UV, etc) are all potent sources of energy. The present conception of induced mutation has been that the release of a quantity of this energy in or near a gene made it chemically unstable so that it would react or disintegrate; this chemical change would then be a mutation, but it is not something that the organism can do anything about. Since most mutations are deleterious, it would be to the immediate advantage of any species to be able to prevent them, but this they cannot do. Light reactivation of "lethal mutations" must mean that certain wavelengths of visible light may be able to "deactivate" the unstable gene. It has been found that UV-irradiated cells eventually lose the capacity to be reactivated, probably when the excited or activated gene breaks down. Visible light does not cause reverse mutations, but it may be able to reverse the first step in the action of UV. I don't want to give you the idea that this problem has been solved; far from it. Novick and Szilard are working on just the point that you ~~are~~ suggested- it is fairly obvious- whether visible light will prevent the complete development of visible or biochemical mutations as well as lethals. Luria and Dulbecco had been working on the same thing with phage independently of Kelner.

Now back to your letter. The gene is not a component of metabolism. The gene is a unit of inheritance. If it works as an enzyme, it is a "Father of Enzymes" it produces the enzymes of metabolism. Light is not a catalyst; it is a source of energy, and in order to be used a very complicated repertory of enzymes has to function in photosynthesis. For these enzymes, too, genes underlie their production. To suggest that genes are developed as a substitute for the catalytic functions of light is to put the cart way ahead of the horse. Gene systems have been developed which allow the efficient utilization of light, but probably photosynthesis is far less ancient than genes.

I'll be glad to send you a copy of "Novel Genotypes" although I can't understand why you'd want to read it, as it has purely historical interest. I don't know why Arrian would put it on his reading list, except that possibly it was written in the simplest form possible to fit the needs of the occasion. I'm very sorry that I can't send you reprints of other people's work, for the simple reason that I'm using them here all the time for research, teaching and writing, and simply can't afford to let them out. Perhaps you can get some of them at the library, or induce Dr. Srb to loan them to you. But you know that you can have anything that I have in duplicate, or any of our reprints.

I am certainly not going to scoff at your ~~last~~ intentions of going to Caltech. It is a fine institution, and with your intelligence and enthusiasm you would probably do very well, if you saw to it that you ~~xxxxxx~~ were properly prepared in college. But I implore you to think very seriously about making definite plans now as to the precise field that you were going to follow. Probably this is unnecessary, because when I was at Columbia, the last things in the world that I thought I would go into were genetics and bacteriology. But can't you visualize what we would both be up against, let's say the minute you applied for a fellowship to work in genetics at Caltech. As soon as he saw your name, Beadle would identify you with me, and square us up. There might even be some apparent advantage at first, because I think that "Lederberg" would be favored. But then you would never know whether you were being judged as yourself or as me. A comparison of us would be inevitable, and comparisons are always odious because one of us would come off the poorer, and it doesn't matter which one.

At this stage of the game, you haven't had enough laboratory and academic experience to know what the other opportunities are in science, and which of them would suit you best. You'd be the first to admit that you'll have to learn a lot more chemistry and biology. Why not use your imagination constructively in getting as thorough and ~~xxxx~~ fundamental a background as you can in the ~~xxxx~~ basic sciences before you decide irrevocably what directions you will take. The science of the near future seems likely to be nuclear physics and chemistry. All of this has biological applications too, but there is an immense amount of research to be done in pure and biological chemistry with isotopes. The additional bit of experience that you've had in "electronics" can be of immeasurable help in that kind of direction. But it is probably too early even to indicate what areas should be looked at; there are any number of them, and all require very sound and thorough training in all of the fundamental sciences. You should be familiar with the relationship between temperature and emission spectra before you could take very seriously your own ideas on radiation effects. But you've said this yourself in your letter, and perhaps I am over-anxious in writing this way. But the directions that you've suggested are very disturbing and they should be thought out very carefully.

I note that you're buying a car. I hope that you don't think that your \$25 is going to be the final investment in it— or are you in with a skilled mechanic who can keep it in repair. We have been having a little trouble with our Chevy. Whatever you do, don't drive without liability insurance! It would be very easy to mortgage your whole future with a \$25,000 judgment if you happened to have an accident; and even if it were not your fault, you'd have a lot of trouble and expense proving it without the legal backing of an insurance company.

Esther and I will be very glad to have you visit with us, but not on the basis that you suggested. If I had the time, which I won't, it would still be a very bad idea to have you here as a student of mine, for the reasons which I gave above. Have you thought of doing some summer research work sometime at Woods Hole or at Bar Harbor, Maine. They both offer opportunities of just the kind that you are looking for. It's probably too late for this summer, but you should make inquiries next year. Besides, both of these places are quite good vacation sites! If you can come here the middle or end of June, it would be best for us; we hope to be able to take some sort of vacation the end of August, and we look forward to seeing you.

Please don't mind my "Dutch-Uncle"; but it's just a reflection of the interest and affection I have for you.

Sincerely,